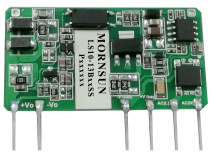
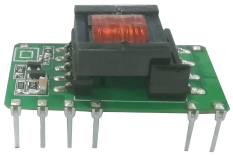
AC/DC Converter

LS10-13BxxSS(-F) Series

MORNSUN®

10W, DIY AC/DC converter





Report EN62368-1 CB IEC62368-1 UK CA BS EN 62368-1 RoHS

FEATURES

- Ultra-wide 85 - 305VAC and 100 - 430VDC input voltage range
- Accepts AC or DC input (dual-use of same terminal)
- Operating ambient temperature range: -40℃ to +85℃
- Multi-application available, flexible layout
- High power density, high reliability
- Low power consumption, green power
- Output short circuit, over-current, over-voltage protection
- Designed to meet UL62368, IEC/EN/UL60335 safety standards

LS10-13BxxSS(-F) series is one of Mornsun's highly efficient green power AC-DC Converter series. They feature ultra-wide wide input range accepting either AC or DC voltage, high efficiency, low power consumption and CLASS II reinforced isolation. All models are particularly suitable for industrial control, electric power, instrumentation and smart home applications which don't have high requirement for dimension. A variety of EMC external circuits meet the needs of multiple industries.

Selection Guide

Certification	Part No.*	Output Power	Nominal Output Voltage and Current (Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (uF) Max.
EN/IEC	LS10-13B03SS(-F)	6.6W	3.3V/2000mA	70	1500
	LS10-13B05SS(-F)	10W	5V/2000mA	76	1500
	LS10-13B09SS(-F)		9V/1100mA	78	1000
	LS10-13B12SS(-F)		12V/830mA	80	680
	LS10-13B15SS(-F)		15V/670mA	81	470
	LS10-13B24SS(-F)		24V/420mA	82	330

Note: ① *An "-F" suffix designates horizontal package vs. standard vertical mounting.
② If the product is used in a severe vibration application, it needs to be glued and fixed.
③ The product picture is for reference only. For details, please refer to the actual product.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	AC input	85	--	305	VAC
	DC input	100	--	430	VDC
Input Frequency		47	--	63	Hz
Input Current	115VAC	--	--	0.3	A
	230VAC	--	--	0.15	
Inrush Current	115VAC	--	15	--	
	230VAC	--	30	--	
Recommended External Input Fuse		1A, slow-blow, required			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	0% - 100% load	3.3V output	--	±1.5	±3	%
		Other output	--	±1	±2	
Line Regulation	Rated load		--	±0.5	±1	
Load Regulation	0% - 100% load		--	±1	±1.5	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)		--	80	150	mV
Temperature Coefficient			--	±0.02	--	%/°C
Short Circuit Protection			Hiccup, continuous, self-recover			
Over-current Protection			⩾110%Io, self-recover			
Over-voltage Protection	3VDC/5VDC Output		⩽9VDC (Output voltage clamp or hiccup)			
	9VDC Output		⩽15VDC (Output voltage clamp or hiccup)			
	12VDC/15VDC Output		⩽25VDC (Output voltage clamp or hiccup)			

	24VDC Output	≤35VDC (Output voltage clamp or hiccup)			
Minimum Load		0	--	--	%
Note: * The "parallel cable" method is used for ripple and noise test, please refer to AC-DC Converter Application Notes for specific information.					

General Specifications

Item		Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input-output	Electric Strength Test for 1min., leakage current<5mA	3000	--	--	VAC
Operating Temperature			-40	--	+85	℃
Storage Temperature			-40	--	+105	
Storage Humidity			--	--	95	%RH
Soldering Temperature		Wave-soldering	260 ± 5℃; time: 5 - 10s			
		Manual-welding	360 ± 10℃; time: 3 - 5s			
Power Derating		-40℃ to -25℃	2.67	--	--	%/℃
		+55℃ to +85℃	2.5	--	--	
		85VAC - 100VAC	1	--	--	%/VAC
		277VAC - 305VAC	0.54	--	--	
Safety Standard			IEC/BS EN/EN62368-1 Safety Approval; Designed refer to UL62368-1, IEC/EN/UL60335-1			
Safety Class			CLASS II			
MTBF			MIL-HDBK-217F@25°C > 300,000 h			

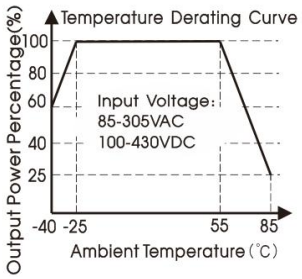
Mechanical Specifications

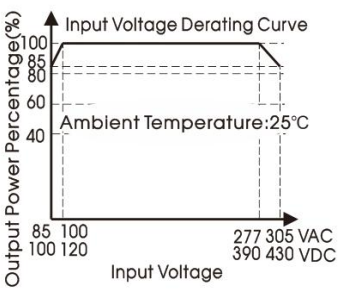
Case Material	44.50 x 24.00 x 15.00mm
Weight	11g (Typ.)
Cooling method	Free air convection

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS A (Recommended circuit 1, 4)	
		CISPR32/EN55032	CLASS B (Recommended circuit 2, 3)	
	RE	CISPR32/EN55032	CLASS A (Recommended circuit 1, 4)	
		CISPR32/EN55032	CLASS B (Recommended circuit 2, 3)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6KV	perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV (Recommended circuit 1, 2)	perf. Criteria B
		IEC/EN61000-4-4	±4KV (Recommended circuit 3, 4)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±1KV (Recommended circuit 1, 2)	perf. Criteria B
		IEC/EN61000-4-5 IEC/EN61000-4-5	line to line ±2KV (Recommended circuit 3, 4) line to line ±4KV (Recommended circuit 4)	perf. Criteria B
	CS	IEC/EN61000-4-6	10Vr.m.s	perf. Criteria A
	Voltage dip, short interruption and voltage variation	IEC/EN61000-4-11	0%, 70%	perf. Criteria B

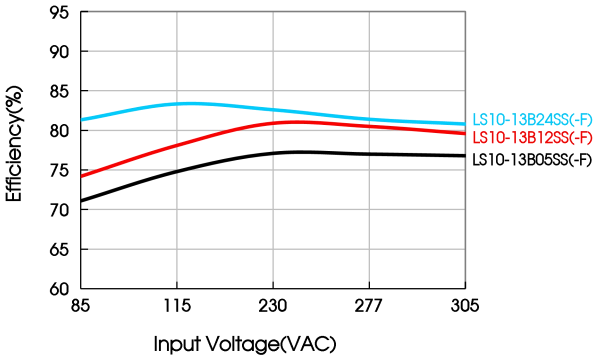
Product Characteristic Curve



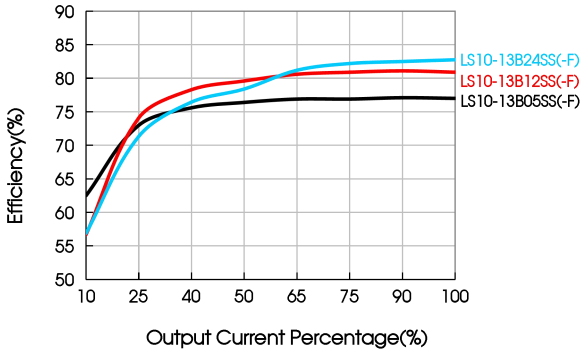


Note: ① With an AC input between 85 -100VAC/277- 305VAC and a DC input between 100 - 120VDC/390 - 430VDC, the output power must be derated as per temperature derating curves;
② This product is suitable for applications using natural air cooling; for applications in closed environment please consult Mornsun FAE.

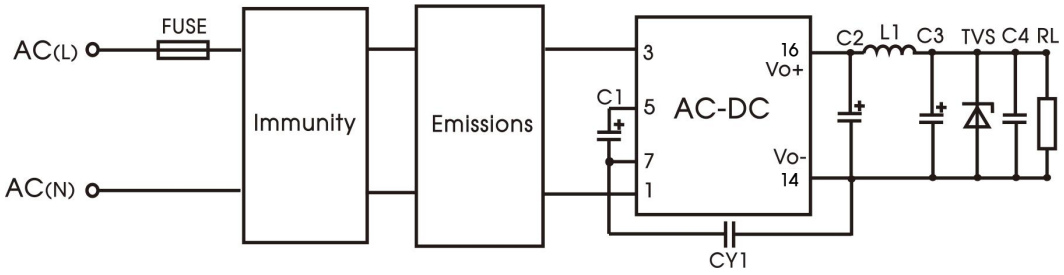
Efficiency Vs Input Voltage (Full Load)



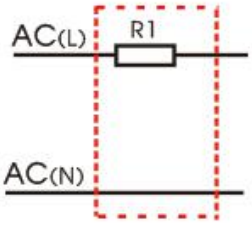
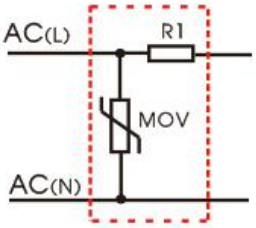
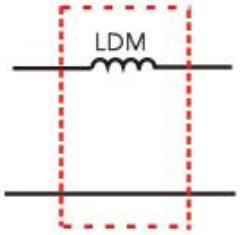
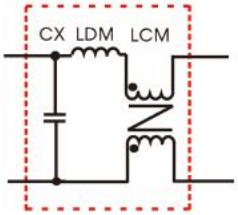
Efficiency Vs Output Load(Vin=230VAC)



Additional Circuits Design Reference



LS(-F) series additional circuits design reference

Immunity design circuits for reference		Emissions design circuits for reference	
Level 3	Level 4	Class A	Class B
			

LS10(-F) series additional components selection guide							
Part No.	FUSE(required)	C1required)	C2 (required)	L1 (required)	C3 （required）	C4	CY1 （required）
LS10-13B03SS(-F)	1A/300V	22μF/450V	470μF/16V (solid-state capacitor)	4.7μH (Max 60mΩ)	150μF/35V	0.1μF/ 50V	1.0nF/ 400VAC
LS10-13B05SS(-F)							
LS10-13B09SS(-F)			270μF/16V (solid-state capacitor)		100μF/35V		
LS10-13B12SS(-F)							
LS10-13B15SS(-F)			470uF/35V		47μF/35V		
LS10-13B24SS(-F)			220uF/35V				

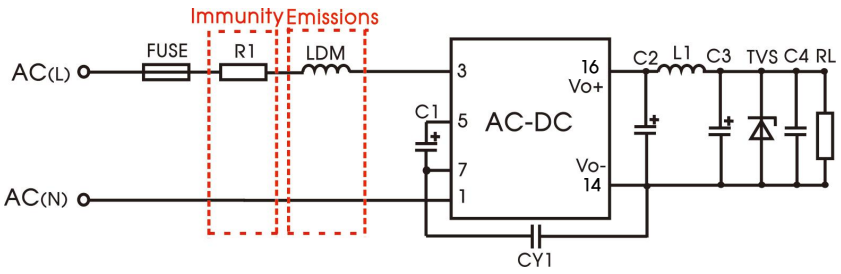
Note:
1. C1: input capacitors, C2: output storage capacitors, they must be connected externally.
2. We recommend using an electrolytic capacitor with high frequency and low ESR rating for C3 (refer to manufacture's datasheet). Combined with C2, L1, they form a pi-type filter circuit. Choose a capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C4 is a ceramic capacitor, used for filtering high frequency noise. A suppressor diode (TVS) is a recommended to protect the application in case of a converter failure and specification should be 1.2 times of the output voltage.

Environmental Application EMC Solution

LS(-F) series environmental application EMC solution selection table						
Recommended circuit	Application environmental	Typical industry	Input voltage range	Environment temperature	Emissions	Immunity
1	Basic application	None	85～305VAC	-40℃ to +85℃	Class A	Level 3
2	Indoor civil environment	Smart home/Home appliances (2Y)		-25℃ to +55℃	Class B	Level 3
	Indoor general environment	Intelligent building/Intelligent agriculture				
3	Indoor industrial environment	Manufacturing workshop		-25℃ to +55℃	Class B	Level 4
4	Outdoor general environment	ITS/Video monitoring/Charging point/Communication/Security and protection		-40℃ to +85℃	Class A	Level 4
	Outdoor harsh environment	On-line power meter Communication base station		-40℃ to +85℃	Class A	>Level 4 Surge: line to PE ±4KV EFT: Level 4

Electromagnetic Compatibility Solution--Recommended Circuit

1. Recommended circuit 1——Basic application

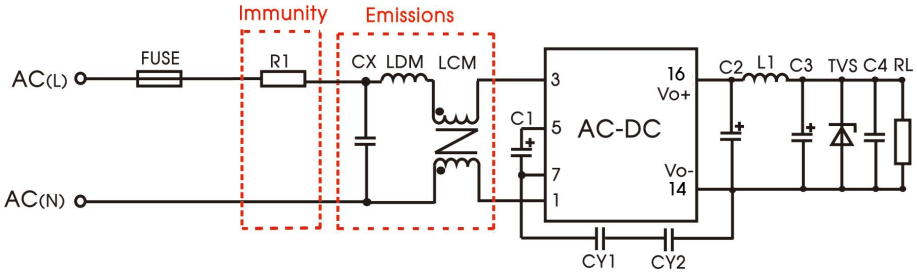


recommended circuit 1

Application environmental	Ambient temperature range	Immunity Level	Emissions Class
Basic application	-40℃ to +85℃	Level 3	Class A

Component	Recommended value
R1	12Ω/3W
LDM	4.7mH

2. Recommended circuit 2——Indoor civil /Universal system recommended circuits for general environment

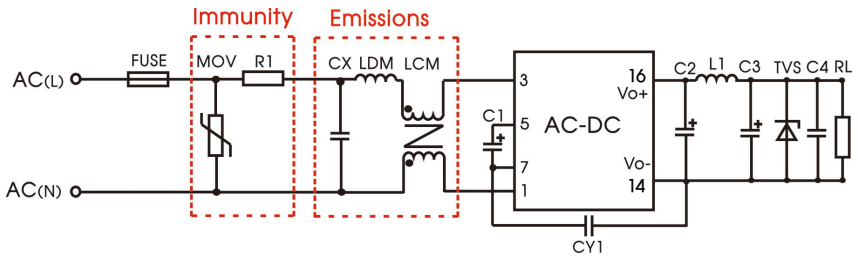


Recommended circuit 2

Application environmental	Ambient temperature range	Immunity Level	Emissions Class
Indoor civil /general	-25℃ to +55℃	Level 3	Class B

Component	Recommended value
R1	12Ω/3W
CY1(CY2)	1.0nF/400VAC
LCM	3.5mH
LDM	0.33mH
CX	0.1μF/310VAC
FUSE (required)	1A/300V, slow-blow
Note: In the home appliance application environment, the two Y capacitors of the primary and secondary need to be externally connected (CY1/CY2, value at 2.2nF/400VAC), which can meet the EN60335 certification. In other industries, only one Y capacitor is needed.	

3. Recommended circuit 3——Universal system recommended circuits for indoor industrial environment

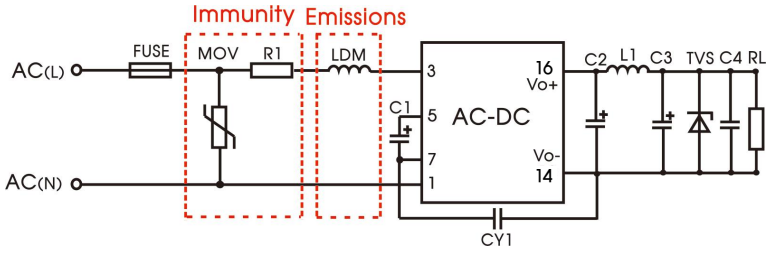


Recommended circuit 3

Application environmental	Ambient temperature range	Immunity Level	Emissions Class
Indoor industrial	-25℃ to +55℃	Level 4	Class B

Component	Recommended value
MOV	S14K350
C1	450V/22uF
CY1	2.2nF/400VAC
CX	0.1μF/310VAC
LCM	3.5mH
LDM	0.33mH
R1	12Ω/3W
FUSE (required)	2A/300V, slow-blow

4. Recommended circuit 4——Universal system recommended circuits for outdoor general/harsh environment



Recommended circuit 4

Application environmental	Ambient temperature range	Immunity Level	Emissions Class
Outdoor general environment	-40℃ to +85℃	Level 4	Class A

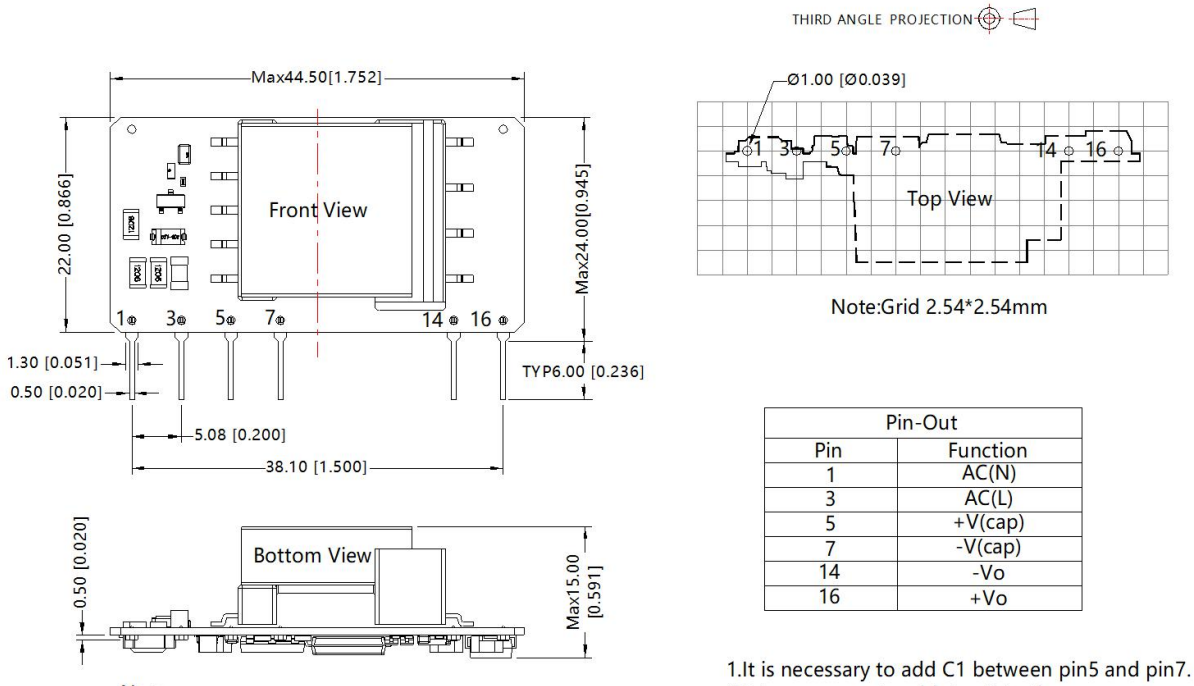
Component	Recommended value
MOV	S14K350
C1	450V/22uF
LDM	4.7mH
R1	12Ω/3W
FUSE (required)	2A/300V, slow-blow

Application environmental	Ambient temperature range	Immunity Level	Emissions Class
Outdoor harsh environment	-40℃ to +85℃	>Level 4 Surge: line to PE ±4KV EFT: Level 4	Class A

Component	Recommended value
MOV	S20K350
C1	450V/33uF (Surge protection priority)
LDM	4.7mH
R1	33Ω/5W
FUSE (required)	6.3A/300V, slow-blow

5. For additional information please refer to application notes on www.mornsun-power.com.

LS10-13BxxSS Dimensions and Recommended Layout

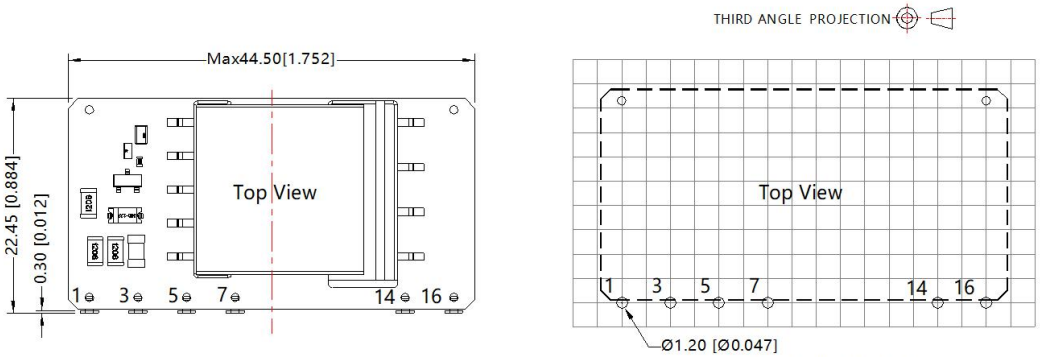


Pin-Out	
Pin	Function
1	AC(N)
3	AC(L)
5	+V(cap)
7	-V(cap)
14	-Vo
16	+Vo

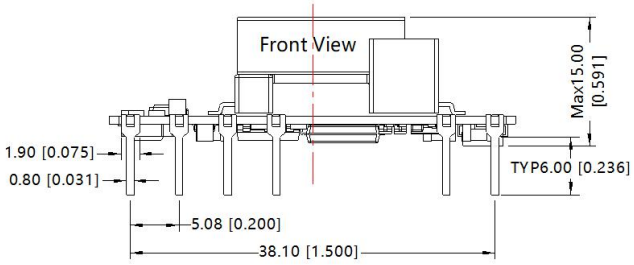
Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]
The layout of the device is for reference only, please refer to the actual product

1.It is necessary to add C1 between pin5 and pin7.
2.It is necessary to add circuit to the output, such as the recommended circuit 1.

LS10-13BxxSS-F Dimensions and Recommended Layout



Note:Grid 2.54*2.54mm



Pin-Out	
Pin	Function
1	AC(N)
3	AC(L)
5	+V(cap)
7	-V(cap)
14	-Vo
16	+Vo

Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
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The layout of the device is for reference only, please refer to the actual product

1.It is necessary to add C1 between pin5 and pin7.
2.It is necessary to add circuit to the output, such as the recommended circuit 1.

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220085(LS10-13BxxSS); 58220025(LS10-13BxxSS-F);
2. External electrolytic capacitors are required to modules, more details refer to typical applications;
3. This part is open frame, at least 6.4mm safety distance between the primary and secondary external components of the module is needed to meet the safety requirement;
4. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%, nominal input voltage (115V and 230V) and rated output load;
5. In order to improve the efficiency at light load, there will be audible noise generated, but it does not affect product performance and reliability;
6. All index testing methods in this datasheet are based on our company corporate standards;
7. We can provide product customization service, please contact our technicians directly for specific information;
8. Products are related to laws and regulations: see "Features" and "EMC";
9. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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